INFRARED SPECTROPHOTOMETRY OF IO BETWEEN 2-13 μm; D. L. Blaney and M. S. Hanner, Jet Propulsion Laboratory, California institute. of Technology, MS183-501, 4800 Oak Grove Drive, Pasadena CA, 91109.

Spectra of Io were collected using the Aerospace Corp. liquid-He-cooled spectrograph at the NASA Infrared Telescope Facility on February 7 and 8, 1993. The instrument spans the wavelength region 2-14 μm with resolving power 20-70 using two 58-element Blocked Impurity Band (BIB) linear arrays [1,2]. All spectral elements are observed simultaneously and there tire no moving parts. The observations covered the longitudes of 225°-2.600 West longitude on February 7, and 70°-1050 West longitude on February 8.

Figure 1 shows a spectra at 70° West longitu de relative to the infrared standard star Alpha Boo on a logrhythmic scale. The broad spectral range covered contains both reflected solar radiation, emission from thermal anomalies (i.e. volcanic regions), and background emission from passive solar heating of the surface. The shape of the plank curve. with wavelength is a strong function of temperature, therefore observations Of Io at different wavelengths are sensitive to different surface temperature components. Imposed (m the. continuum from thermal emission and reflected solar flux, are an absorption feature from SO_2 frost (4 μm), and possible emission features (between 7 - 13 μm) from silicates, sulfur, and SO_2 flint. These emission features, if present, are expected to be Only small variations from black body emission.

Measuring the band depth of 4 μm feature due to SO_2 frost can be problematic. Previous determinations Of SO_2 band depth (on average S0-70%) were made by ratioing the reflectance in the core Of the band to the continuum [3], 110wcvcl, significant thermal emission may be present at 4 μm. 1 estimating absorption band depths in wave.lcIlgtlI regions where there are substantial components Of both reflected and emit ted radiat i On requires knowledge Of the thermal emission. This especially important for 10, as the higher temperature components (which effect the 4 μm fluxes) is highly variable (e.g. 4). The simultaneous collect ion Of long and short wavelength measurements presented here, allow for the removal Of different amounts Of thermal emission. This should provide a more accurate estimate.s Of SO_2 coverage and be more sensitive to variations in SO_2 abundance.

in order to accurately model the thermal emission and to remove stellar emission feat ures, the spectra need to be calibrated radiometrically. **Figure 2 shows** the same spectra between 7 and 13 μm multiplied by the flux density from Alpha Boo. The flux from Alpha Boo **was** determined by taking the ratio of Alpha Boo to Vega and then multiplying by the. flux from Vega [5] (personal communication M. Hanner 1993). As can be seen in **figure** 2, there is a great deal Of structure in the spectra. We will be extending the radiometric calibration to all wave.lcng,ths measured and begin detailed modeling of the spectra. From this we will be able to determine the. temperatures and areas of the.rma] anomalies, the SO_2 band depth, and if there are any variations in emissivity.

References: 1. Warren D.W. and Hackwell J.A.,, SPIE, 1155, 314, 1989. 2. Hackwell et al., Proc. SPIE Conf. 1235 (m Instrumentation in Astronomy VI], 1990. 3. Howell et al., Icarus, 57, 82., 1984. 4. Veeder et al. this volume. 5, Rieke et al., Astron. J., 90, 900-906," 1985.

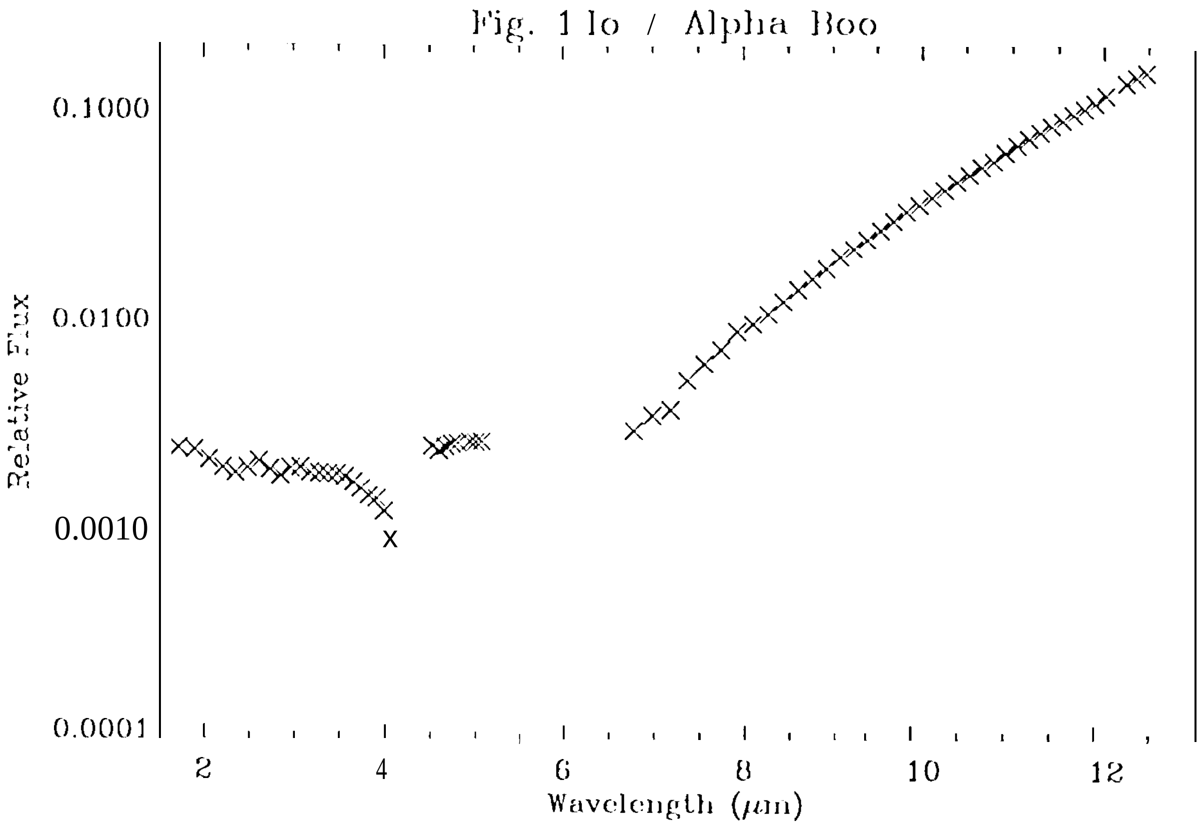
Fig. 1 Io / Alpha Boo
Relative Flux
0.1000
0.0100
0.0010
0.0001
2
4
6
8
10
12
Wavelength (μm)

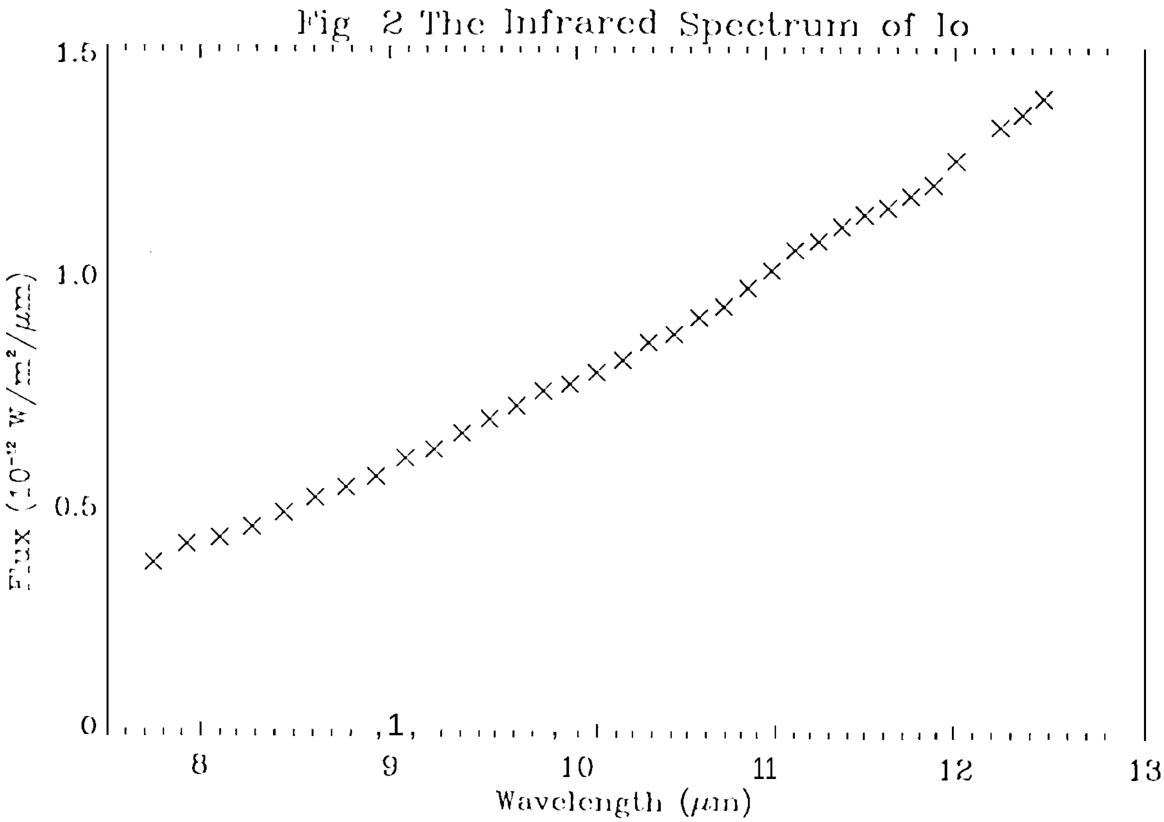
Fig 2 The Infrared Spectrum of Io
Flux (10^{-12} W/m^2/μm)
1.5
1.0
0.5
0
8
9
10
11
12
13
Wavelength (μm)